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PATENT
Docket No. 150.00640102

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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| Applicant(s): Eugene P. Marsh |) | Group Art Unit: | 2815 |
| Serial No.: 09/942,200 |) | Examiner: | J. Nguyen |
| Confirmation No.: 8194 |) | | |
| Filed: 29 August 2001 |) | | |
| For: DIFFUSION BARRIER LAYERS AND METHODS OF FORMING SAME |) | | |

DECLARATION UNDER 37 C.F.R. § 1.131

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

I, Eugene P. Marsh, declare and say as follows:

1. I am the inventor of the subject matter claimed in U.S. Patent Application Serial No. 09/942,200, filed 29 August 2001, which is a divisional application of U.S. Patent Application Serial No. 09/146,866, filed 3 September 1998, and issued as U.S. Patent No. 6,323,081 B1, on 27 November 2001.
2. I received a PhD. from the University of California, Santa Barbara. I have been employed at Micron Technology, Inc. since November 1995.
3. Prior to 28 July 1998, I conceived of using a platinum-ruthenium alloy as a barrier layer for use in semiconductor device structures, as described below and shown in the accompanying Exhibits.
4. I reduced to practice a platinum-ruthenium alloy as a barrier layer for use in semiconductor device structures before 28 July 1998, which is the U.S. filing date for U.S. Patent No. 6,358,810 B1 to Dornfest et al., issued 19 March 2002 (hereinafter "Dornfest et al.").
5. Exhibit A shows an X-ray photo-electron spectroscopic (XPS) depth profile, taken prior to 28 July 1998, of a platinum-ruthenium alloy having a composition of platinum(x): ruthenium. The platinum-ruthenium alloy analyzed in Exhibit A was produced by CVD co-

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deposition of platinum and ruthenium on a silicon (Si) substrate. The resulting structure of Exhibit A includes an upper platinum "electrode" layer having a thickness of about 300 Angstroms located over the platinum(x):ruthenium alloy barrier layer, which has a thickness of about 200 Angstroms. As illustrated in this exhibit, x may encompass a range, e.g., about 0.60 to about 0.995, that is within the ranges defined in the pending claims of the captioned application. The data presented in Exhibit A was measured after anneal in an oxygen atmosphere.

6. Exhibit B shows an XPS montage plot, taken prior to 28 July 1998, of a co-deposited platinum(x):ruthenium layer on a Si substrate after a rapid thermal oxidation process at 750 degrees C. This montage plot corresponds to the structure represented in Figure 6B of the application. The montage plot illustrates binding energies measured over a range of relative depths ("cycles"). The plot indicates a photoelectron peak corresponding to Si 2p at the interface between the deposited layer and the Si substrate. However, there is no peak corresponding to SiO₂ and, as such, demonstrates a lack of SiO₂ at the interface of the deposited layer and the Si substrate. This lack of SiO₂ at the interface indicates that the deposited platinum-ruthenium alloy is usable as an effective barrier layer.

7. On information and belief pursuant to the facts and evidence provided herein, the invention embodied within the structure described above was reduced to practice prior to the filing date of Dornfest et al.

8. I further declare that statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.


Date

3/26/04
Eugene P. Marsh